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**Fax Number:**

703-872-9310

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703-872-9309

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Appln. No: 09/631,491

Filed: August 3, 2000

Group Art Unit: 1700

Number of Pages: (including cover page) **6****IF NOT RECEIVED PROPERLY, PLEASE NOTIFY US IMMEDIATELY AT 1175.**

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**GROUP 1700**

Attorney's Docket No. 035576/201983PATENT

## IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re: Maeda, et al. Confirmation No.: 9818  
Appl. No.: 09/631,491 Group Art Unit: 1742  
Filed: August 3, 2000 Examiner: Wilkins III, Harry D.  
For: HYDROGEN ABSORBING ALLOY AND NICKEL-METAL  
HYDRIDE RECHARGEABLE BATTERY

April 21, 2003

Commissioner for Patents  
Washington, DC 20231

## RESPONSE

Sir:

This is in response to the Office Action mailed December 20, 2002, in the above-referenced RCE application. The rejections of record are addressed below in the order presented in the Office Action.

Claims 1, 5-7, 12, 16, and 17 are rejected under 35 U.S.C. 103(a) in view of Yanagihara et al. (JP60-250557). Applicants respectfully traverse this rejection.

The present invention is directed to a hydrogen absorbing alloy having a  $\text{CaCu}_5$  crystal structure in its principal phase. The alloy includes 24 to 33% by weight La; 0.1 to 1.0% by weight Mg; and greater than 0% and less than or equal to 6% by weight of Co. Yanagihara et al. do not teach or suggest an alloy with Co in the claimed amount.

As discussed in Applicants' response filed September 30, 2002, Yanagihara et al. list fourteen alloy compositions. The La, Mg, and Co contents have been calculated for each composition as shown in Table 1.

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Table 1. Alloy of Yanagihara et al.

No.	Alloy	Content (wt%)		
		La	Mg	Co
1	LaNi <sub>5</sub>	32.1	0.0	0.0
2	La <sub>0.9</sub> Ca <sub>0.1</sub> Ni <sub>4.5</sub> Co <sub>0.5</sub>	29.6	0.0	7.0
3	LaNi <sub>2.7</sub> Co <sub>2</sub> Al <sub>0.3</sub>	32.8	0.0	27.8
4	LaNi <sub>3</sub> Co <sub>1.7</sub> Al <sub>0.3</sub>	32.8	0.0	23.7
5	LaNi <sub>3.5</sub> CoAl <sub>0.5</sub>	33.3	0.0	14.1
6	LaNi <sub>3</sub> Co <sub>2</sub>	32.1	0.0	27.2
7	LaNi <sub>3</sub> Co <sub>1.7</sub> Sn <sub>0.3</sub>	30.8	0.0	22.2
8	LaNi <sub>3</sub> Co <sub>1.7</sub> Mg <sub>0.3</sub>	32.9	1.7	23.7
9	LaNi <sub>3</sub> Co <sub>1.7</sub> Fe <sub>0.3</sub>	32.2	0.0	23.2
10	LaNi <sub>3</sub> Co <sub>1.7</sub> Fe <sub>0.3</sub> Mo <sub>0.1</sub>	31.5	0.0	22.7
11	LaNi <sub>3</sub> Co <sub>1.7</sub> Ta <sub>0.3</sub> V <sub>0.1</sub>	29.3	0.0	21.1
12	LaNi <sub>3</sub> Co <sub>2</sub> Cr <sub>0.3</sub>	31.0	0.0	26.3
13	LaNi <sub>3</sub> Co <sub>2</sub> Mn <sub>0.1</sub>	31.7	0.0	26.9
14	LaNi <sub>3</sub> Co <sub>2</sub> Al <sub>1.2</sub>	34.2	0.0	29.0

\* Atomic weight for each element is as follows:  
 La: 138.9, Ca: 40.1, Mg: 24.3, Ta: 180.9, Mn: 54.9  
 Ni: 58.7, Al: 27.0, Fe: 55.8, V: 50.9,  
 Co: 58.9, Sn: 118.7, Mo: 95.9, Cr: 52.0,

As is evident from the table, none of the Yanagihara et al. examples contain Co in an amount greater than 0 wt% and less than or equal to 6 wt%, as claimed by Applicants. Further, the Office admits that Yanagihara et al. fails to meet the claimed range of La when the Co content is assumed to be 6.0 wt%. Thus, Yanagihara et al. do not disclose alloys having overlapping concentration ranges, either in the general description or in the examples.

Not only do Yanagihara et al. not teach the claimed alloys; Yanagihara et al. do not suggest modifying the alloys disclosed therein to include Co in the claimed amount. The purpose of Yanagihara et al. is to provide a sealed alkaline battery having a lowered increase of the internal battery pressure by overcharging (page 3, lines 14-16). In describing alloys which lower the increase in battery pressure, Yanagihara et al. provide no teaching or suggestion to

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provide an alloy having the claimed ranges of elements, much less to provide an alloy including Co in an amount greater than 0% and less than or equal to 6 wt%.

The purpose of the instant invention, which is quite unrelated to the purpose and teaching of Yanagihara et al., is to combine the favorable particle size properties of alloys having high cobalt content with the favorable discharge properties of alloys having low cobalt content. As stated in the specification, alloys with higher cobalt contents are less liable to particle size reduction in their hydrogen-loaded state and effective in prolonging the life of nickel-metal hydride rechargeable batteries when they are used for the negative electrode thereof (the specification page 1 lines 17-23). Alloys with lower cobalt contents are more desirable for an improvement of a high rate discharge property (page 1 line 23 to page 2 line 1).

To solve the problems of the prior art, the present invention provides a hydrogen absorbing alloy which can improve a high rate discharge property while suppressing particle size reduction, which exhibits cycle life characteristics equal to or higher than those of conventional alloys even when its cobalt content is decreased, and which has a high capacity (page 2 lines 6-12). These goals are achieved by the invention through use of a unique alloy composition (page 6, lines 9-14).

Yanagihara et al. do not mention the problem solved by the invention, do not teach or motivate one of ordinary skill in the art to search for a solution to the problem, and do not disclose the alloys used in the claimed invention. Yanagihara et al. also do not provide any motivation to create an alloy as recited in the claims to lessen internal battery pressure, which is the motivation for forming the alloys disclosed by Yanagihara et al. Therefore, Applicants submit that the claimed invention is both novel and non-obvious in view of Yanagihara et al.

Claims 1, 5-7, 12, 16, and 17 stand rejected under 35 U.S.C. 103(a) in view of Shindo et al. (JP 07-057769). Applicants respectfully traverse this rejection.

As noted above, the present invention is directed to an alloy that includes 24 to 33% by weight La; 0.1 to 1.0% by weight Mg; and greater than 0% and less than or equal to 6% by weight of Co. Shindo et al. do not teach or suggest an alloy with Mg in the claimed amount. Rather, in contrast to the claimed invention, Shindo et al. require that the alloy disclosed therein

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include Mg in an amount of 0.03 weight percent or less. Thus the claimed invention includes (at a minimum) over three times the amount of Mg allowed by Shindo et al.

Shindo et al. nowhere suggest modifying the amount of Mg present. Indeed, Shindo et al. teach away from the claimed invention. In this regard, the Examiner's attention is directed to paragraph [0010] of the translation provided by the Office. Here, Shindo et al. explain that the presence of the alkaline earth metals, including Mg, reduces the cycle life of a rechargeable battery which uses the alloy as a negative electrode, when the alloy includes such metals in higher amounts. As Shindo et al. teach that increased amounts of Mg undesirably reduces cycle life, at best, one skilled in the art would reduce, not increase, the amount of Mg present in the alloy. Applicants accordingly respectfully request withdrawal of this rejection as well.

The rejections of record having been addressed above, Applicants submit that this application is in condition for allowance which action is respectfully solicited. Should the Examiner have any questions regarding this matter it is respectfully requested that the Examiner contact the undersigned at his convenience.

It is not believed that extensions of time or fees for net addition of claims are required, beyond those, which may otherwise be provided for in documents accompanying this paper. However, in the event that additional extensions of time are necessary to allow consideration of this paper, such extensions are hereby petitioned under 37 CFR § 1.136(a), and any fee required therefore (including fees for net addition of claims) is hereby authorized to be charged to Deposit Account No. 16-0605.

Respectfully submitted,

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